International Journal of Otorhinolaryngology and Head and Neck Surgery
Gupta K et al. Int J Otorhinolaryngol Head Neck Surg. 2021 Mar;7(3):459-462
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20210678

Original Research Article

Changing microbiological picture and sensitivity in otolaryngology in developing world

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Received: 14 August 2020
Revised: 03 October 2020
Accepted: 25 January 2021

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ABSTRACT

Background: Microbiology, culture and sensitivity and antibiotic policy are ever changing in otolaryngology. So, it requires continuous research and modification.
Methods: A retrospective study was conducted at our tertiary care center where microbiology and culture and sensitivity data of patients of chronic otitis media and neck abscess were assessed to form antibiotic policy for the concerned patients. The study comprised of 580 patients of chronic otitis media and 139 patients of neck abscess admitted from October 2018 to December 2019.
Results: *Pseudomonas* and *E. Coli* were the most common microbes isolated with most of cases sensitive to Meropenem and Amikacin respectively.
Conclusions: There is a change in microbiological picture and sensitivity to a more resistant type than the previous studies and hence the requirement of modification of antibiotic policy to a more robust one.

Keywords: Microbiology, ENT, Ear discharge, Neck, Abscess, Sensitivity, Antibiotic, Policy

INTRODUCTION

In an ever-changing world of ear, nose, throat infections, microorganisms involved and their culture and sensitivity response to various antimicrobials, selection of an effective antibiotic policy is always a dilemma for an Otolaryngologist.[1] This dynamic trend necessitates an ongoing research on microorganisms involved and antimicrobials effective against them to design an effective antibiotic policy for each institute. At PGIMS Rohtak India, a tertiary care institute, we conducted a retrospective study from October 2018 to December 2019 including admitted patients and studied pus samples collected from 580 patients of chronic otitis media and 139 patients of neck abscess post incision and drainage under sterile conditions. The samples were assessed for microorganisms involved and their culture and sensitivity at 24, 48, 72 and 120 hours.

Amongst chronic otitis patients, Pseudomonas aeruginosa was present in more than 90% of samples. Pseudomonas aeruginosa was sensitive to Meropenem in 94.5%, Imipenem in 89.9% and Piperacillin+ Tazobactam in 47.2% of cases.

Pus from patients with neck abscess yielded *E. Coli* in most of samples followed by *Staphylococcus aureus* and *Klebsiella*. While *E. Coli* was sensitive to Amikacin in

80% of cases followed by Imipenem and Amoxycillin+ clavulanic acid, Staphylococcus aureus was sensitive to Linezolid in 100% of cases followed by Cefuroxime and Amoxycillin+ clavulanic acid.

Ciprofloxacin 20 mg/kg/day orally in 2 divided doses remains the mainstay of empirical therapy for non-hospitalized mild infections of chronic otitis media. Meropenem 40 mg/kg/dose intravenously every 8-12 hours becomes drug of choice for chronic otitis media in admitted patients.[2,3] Combination intravenous therapy of Amikacin 15 mg/kg/day divided in 2-3 doses each day, Ceftriaxone 75 mg/kg/day once daily or in 2 equally divided doses each day and Metronidazole 15 mg/kg loading dose followed by 7.5 mg/kg/dose every 6 hours is the preferred regime for neck abscess.[4-6]

Aim and objectives

To study the microbiological and culture and sensitivity pattern for chronic otitis media and neck abscesses in current scenario and to find an effective antibiotic policy for the same.

METHODS

Study design

This was a retrospective study conducted after ethical approval from Post Graduate Board of Studies, Pt B D Sharma PGIMS Rohtak.

Inclusion criteria

The study comprised of immunocompetent patients of age 6-46 years and both sexes who were admitted in ENT Ward at Pt B D Sharma PGIMS from October 2018 to December 2019 for either chronic ear discharge of chronic otitis media of more than three months duration unresponsive to oral antibiotics or for inflammatory neck abscess which was planned for incision and drainage.

Exclusion criteria

Patients less than 6 years of age, more than 46 years of age, immunocompromised patients, those suffering from malignancy, those suffering from mycobacterial, fungal, protozoal and viral infections were excluded from the study.

Study procedure

All patients underwent detailed evaluation based on history, general physical examination and detailed head and neck examination. Otoscopy, lymph node examination, complete blood counts, fasting blood sugars, viral markers and chest X ray were done in all patients. All neck patients additionally underwent ultrasonography of neck abscess. Contrast enhanced computerized tomography of neck was done in selected patients. Gram stain, Ziehl-Neelsen stain for acid fast bacilli and pus culture and sensitivity were sent in all cases. 719 subjects met inclusion and exclusion criteria. Initially all patients were started on empirical therapy based on antibiotic policy of the institute. Meanwhile, staining and culture and sensitivity reports were assessed at 24, 48, 72 and 120 hours. Sensitivity was put for commonly used antibiotic for each microbe. For example, for pseudomonas, sensitivity was put for Ciprofloxacin, Cefepime, Amikacin, Cefoperazone+ Sulbactam, Cefoperazone+ Tazobactam, Piperacillin+ Tazobactam, Meropenem and Imipenem.

Sensitivity was sent for extended spectrum antibiotics when a microbe came resistant to all commonly used antibiotics for that microbe. Extended spectrum antibiotics included Cloxacillin, Polymixin B, Netilimycin, Doripenem, Aztreonam, Cefixime+ Clavulanic acid and Tegecycline.

As culture and sensitivity reports were available, antibiotics were upgraded in clinically unresponsive patients. Antibiotics with maximum sensitivity to the isolated microorganisms and least toxicity profile were preferred. Complete blood counts, kidney function tests and liver function tests were sent on alternate days to monitor drug toxicity. The cases which required change of antibiotic because of drug toxicity and poor clinical response were recorded separately. Patients were discharged on oral antibiotics once there was no pus for consecutive three days. All patients were followed regularly in outpatient department afterwards.

All the data collected was tabulated in the MS Excel spreadsheet and coded appropriately. Analysis was carried out using Statistical Package for Social Studies (SPSS) for Windows 24.0.

RESULTS

580 patients of chronic otitis media with ear discharge of more than 3 months duration unresponsive to oral antibiotics admitted from October 2018 to December 2019 are included in the study.

Table 1: Culture and sensitivity results of 550 patients of refractory chronic otitis media infected with *Pseudomonas aeruginosa.*

Antibiotic	No of sensitive cases	Percentage
Meropenem	520	94.5
Imipenem	490	89.9
Piperacillin+ Tazobactam	260	47.2
Amikacin	90	16.3
Cefoperazone+ Sulbactam	40	7.2
Ciprofloxacin	30	5.4

Pseudomonas aeruginosa was isolated from 550 out of 580 patients (>90%).

30 patients with *Pseudomonas aeruginosa* were resistant to all commonly used antibiotics and many extended spectrum antibiotics. However, no resistance was noted against Polymyxin B and Doripenem.

Table 2: Antibiotic sensitivity in 53 patients of neck abscess infected with *Enterobacteriaceae*.

Antibiotic	No of sensitive cases	Percentage
Amikacin	44	80
Imipenem	37	69
Amoxicillin+ clavulanic acid	37	69
Cefepime	20	37
Piperacillin+ Tazobactam	20	37
Ciprofloxacin	18	33

Table 3: Antibiotic sensitivity in 36 patients of neck abscess infected with *Staphylococcus aureus*.

Antibiotic	No of sensitive cases	Percentage
Linezolid	36	100
Cefuroxime	30	83
Clindamycin	20	55
Doxycycline	20	55
Amoxycillin+ Clavulanic acid	20	55
Erythromycin	12	33
Cotrimoxazole	12	33

Table 4: Dosage of Meropenem in accordance with creatinine clearance[7].

Creatinine clearance (mL/min)	Meropenem dosage
>50	0.5-1 gm IV 8 hourly
26-50	0.5-1 gm IV 12 hourly
10-25	0.25-0.5 gm IV 12 hourly
<10	0.25-0.5 gm IV 24 hourly

Table 5: Dosage of Piperacillin and Tazobactam in accordance with creatinine clearance[9].

Creatinine clearance (mL/min)	Piperacillin+ Tazobactam dosage
>40	No dose adjustment
20-40	4 gm/0.5 gm every 8 hourly
<20	4 gm/0.5 gm every 12 hourly

139 patients admitted with neck abscess from October 2018 to December 2019 were included in the study.

Enterobacteriaceae was present in 53 out of 139 samples (38.13%). Out of which *E. coli* was the most common species followed by *Klebsiella*, *Proteus* and *Acinetobacter*.

50 samples were either sterile or micrococcus contaminant.

Staphylococcus aureus was isolated in 36 samples (26%).

DISCUSSION

An effective antibiotic policy chooses the most effective drug with least toxicity.

Dose modification is often needed in patients with renal involvement.

Ciprofloxacin 20 mg/kg/day orally in 2 divided doses along with Ciprofloxacin ear drops 2 drops 4 times a day remains the mainstay of empirical therapy for non-hospitalized mild infections of chronic otitis media.[2]

Meropenem 40 mg/kg/dose intravenously every 8-12 hours becomes drug of choice for chronic otitis media patients in admitted patients.[3] Total dose should not exceed 4 gram in 24 hours.

Piperacillin and Tazobactam can also be given in the usual dose of 4 gm Piperacillin plus 0.5 gm Tazobactam infusion every 8 hourly over 30 minutes.[8]

Renal function monitoring is required with aminoglycosides, and with fluoroquinolones particularly if baseline serum creatinine is deranged.[10] However, Amikacin is less nephrotoxic than commonly used aminoglycoside Gentamicin.[11] Piperacillin with Tazobactam may be nephrotoxic particularly when given with other nephrotoxic drugs such as Vancomycin.[12] Cefuroxime too carries nephrotoxic potential. Meropenem and Cefoperazone are comparatively less nephrotoxic.[13] But Meropenem and Piperacillin+ Tazobactam both requires dose adjustment in renal patients as already discussed.

Cefoperazone is a 3rd generation cephalosporin which is effective against *Pseudomonas*.[14]

Combination intravenous therapy of Amikacin 15 mg/kg/day divided in 2-3 doses each day4, Ceftriaxone 75 mg/kg/day either in a single dose or two divided doses each day and Metronidazole 15 mg/kg loading dose followed by 7.5 mg/kg/dose every 6 hours is the preferred regime for neck abscess.[5,6]

CONCLUSION

Deciding an appropriate antibiotic in Otorhinolaryngology is a dynamic process and requires continuous research and development. With time, antimicrobial spectrum is

shifting towards more resistant strains and require more robust antibiotic policy.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Gupta K, Mangla A, Swami G, Vikas, Rashi, Yadav N. Changing microbiological picture and sensitivity in otolaryngology in developing world. Int J Otorhinolaryngol Head Neck Surg 2021;7:459-62.